

# Medical Science

25(117), November, 2021

## To Cite:

Bakry S, Alshinkity MI, Abeeri NA, Albagami S, Felemban AS, Bakry S, Jastania R. The awareness of lung cancer risk factors among health-related students at Umm Al Qura University in Makkah, Saudi Arabia. Medical Science, 2021, 25(117), 2998-3006

## Author Affiliation:

<sup>1</sup>Faculty of Medicine, Umm Al-Qura University, Makkah city, Kingdom of Saudi Arabia

<sup>2</sup>Associate Professor, Department of Pathology, Umm Al-Qura University, Makkah city, Kingdom of Saudi Arabia

## Corresponding author

Faculty of Medicine, Umm Al-Qura University, Makkah city, Kingdom of Saudi Arabia  
Email: Alshinkity@gmail.com

## Peer-Review History

Received: 06 October 2021

Reviewed & Revised: 07/October/2021 to 10/November/2021

Accepted: 12 November 2021

Published: November 2021

## Peer-review Method

External peer-review was done through double-blind method.

# The awareness of lung cancer risk factors among health-related students at Umm Al Qura University in Makkah, Saudi Arabia

Salah Bakry<sup>1</sup>, Mohammed Ibrahim Alshinkity<sup>1</sup>✉, Naif Ahmad Abeeri<sup>1</sup>, Saad Albagami<sup>1</sup>, Ammar Sami Felemban<sup>1</sup>, Suhayb Bakry<sup>1</sup>, Raid Jastania<sup>2</sup>

## ABSTRACT

**Background:** Lung cancer has a highly significant rate of mortality in both genders nationally and globally. A variety of risk factors are linked to lung cancer; however, smoking is the most significant one. Countless research has looked into the public's knowledge of lung cancer and its risk factors; however, few studies have targeted health students, which demands further investigation. Our study surveys health students from different health-related colleges in the Makkah region of western Saudi Arabia. We compare the knowledge and awareness of lung cancer risk factors and recommend strategies to improve this knowledge gap. **Methodology:** A survey-based study was carried out among health-related students in different medical colleges at Umm Al-Qura University between December 2020 and January 2021. **Results:** A total of 309 students participated in the current study. The mean age of participants was  $22.2 \pm 1.33$  years; 244 (67.4%) participants were male and 118 (32.6%) were female. The majority of respondents were fifth-year students, while intern students were the least represented. The majority of students did not smoke. Furthermore, our finding suggests that the majority of students have poor knowledge of lung cancers' risk factors (76.6%). **Conclusion:** Our research found that the students had a low level of knowledge. Furthermore, only gender showed a strong correlation with the level of awareness and knowledge, out of all the variables studied.

**Keywords:** knowledge, awareness, lung cancer, health related students, Umm Al-Qura University Saudi Arabia.

## 1. INTRODUCTION

Lung cancer shows a high incidence in men, and it accounts for cancer deaths in both genders (Sholih et al., 2019; Gangane et al., 2015; Lowe stein et al., 2016). Moreover, there is a substantial increasing trend in the global



© 2021 Discovery Scientific Society. This work is licensed under a Creative Commons Attribution 4.0 International License.

prevalence of lung cancer and its mortality (Sholih et al., 2019; Indonesian Health Ministry, 2013; Global Cancer Observatory, 2017; Sholih et al., 2019; Goodarzi et al. 2020; Elaslali et al. 2021). This increase is linked to different risk factors including tobacco smoking (Mahfouz et al., 2020; Zhang et al., 2009), and other carcinogenic materials that can represent occupational lung cancer risk factors, such as exposure to asbestos, radon, and other chemicals (Mahfouz et al., 2020; Tammemägi et al., 2013). Other risk factors identified as potential precipitators of lung cancer include environmental and behavioural (Mahfouz et al., 2020; de Torres et al., 2011). All of these variables have the potential to have a substantial impact on the initiation of carcinogenesis and significantly influence patients' response to exposure to carcinogenic agents (Mahfouz et al., 2020; Cruz et al., 2011).

The socioeconomic status in Saudi Arabia has risen notably over the past 40 years. The lifestyles have become sedentary, accompanied by the consumption of processed food and other unhealthy behaviors (Althubiti & Nour Eldein, 2018; Food and Agriculture Organization of United Nation, 2011). Several diseases are becoming more prevalent due to these lifestyle modifications, including lung cancer (Althubiti & Nour Eldein, 2018; Anand et al., 2008). The estimated incident of lung cancer in Saudi Arabia was 57.2 individuals per 100,000 in 2004 (Althubiti & Nour Eldein, 2018; Ibrahim et al., 2008). Many studies have targeted the general population (Sholih et al., 2019; Ashok, 2019; Crane et al., 2016; Chalian et al., 2019; Mazières et al., 2015) to assess the awareness level of lung cancer and its risk factors; however, few studies have been carried out on university student populations (Al-Naggar, 2012; Zainuddin and Thabit, 2018; Shankar et al., 2017). Therefore, this area was not investigated enough particularly, students of health specialties, as they will be future counsellors and mediators to patients. Consequently, this study examines the awareness of lung cancer risk factors among health related specialties students at Umm Al-Qura University (UQU) in Makkah, Saudi Arabia.

## 2. METHODS AND SUBJECTS

A self-administered structured questionnaire was used in this cross-sectional investigation at UQU, Makkah, Saudi Arabia. The study was carried out from December 2020 until January 2021. Ethical approval was received from UQU's research ethics committee (ethical number: HAPO-02-K-012-2021-03-626).

A random sampling technique was performed to stratify students according to gender and college from all health-related specialties colleges at UQU from 2nd year to 6th year, namely: College of Medicine, College of Applied Medical Sciences, College of Dentistry, College of Pharmacy, College of Public Health and Health Informatics, and College of Nursing. The inclusion criteria were students who are able to speak English, 18 years old and above. However, the exclusion criteria were students who cannot speak English and were below 18 of age. The right answer was used to establish the scoring system. Each correct answer was given two scores, the "don't know" answer was given one score, and the wrong answer was given zero scores, and then the sum of all the scores was calculated. Those who have scores above eight scores are considered to have good awareness, and those having scores below eight are considered to have poor awareness.

Therefore, we assumed that 93% of participants would have knowledge of lung cancer and its determinants, as it has been shown in a Malaysian study that conducted in Management and Science University (MSU) (Al-Naggar, 2012). To test this hypothesis in a cross-sectional study with a 95% confidence interval and 5% acceptable error margin, we needed to survey at least 352 students.

### Sample size

The sample size was estimated using Stat Calc of Open Epi software of Rollin School of Public Health, Emory University, USA (Sullivan, 2009). As a result, the needed minimum sample size required to obtain a precision of 5% with a 95% confidence interval is 350.

### Statistical analysis

The data were examined using statistical methods in SPSS software version 25. For categorical variables, the frequency was computed, and for continuous variables, mean standard deviation was calculated. The categorical variables were compared using the Chi-square test.

## 3. RESULTS

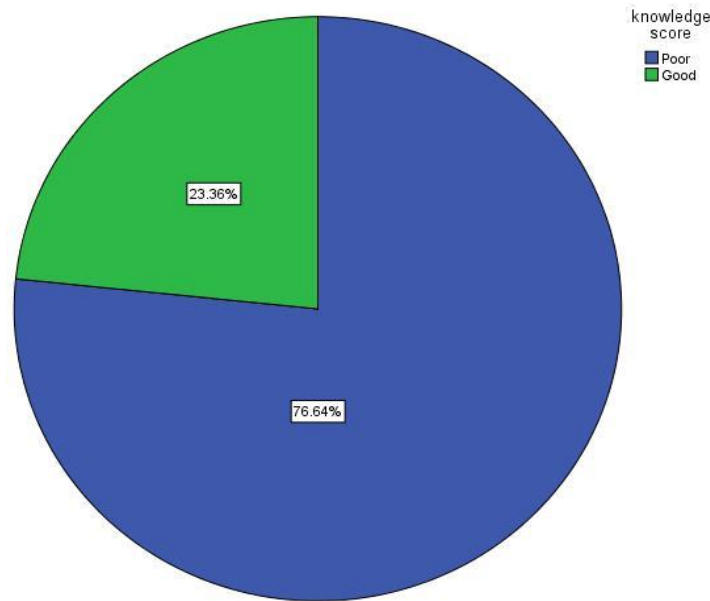
A total of 369 health-related specialties students were participated in this study. Table 1 shows students' gender distribution; over two-thirds of participants were male (237, 67.5%) and one-third were female (114, 32.5%). The mean age of participants was  $22.2 \pm 1.33$ . The College of Medicine was the most represented among the colleges (76.4%), while the College of Public Health and College

of Nursing represented the least (2.8% and 1.7%, respectively) (Table 1). Fifth-year students were the most represented (107, 30.5%); on the other hand, intern students were the least represented (13, 3.7%). Concerning the previously heard about lung cancer, most of the students have low-level of awareness 304 (86.6%). Furthermore, students' level of awareness regarding lung cancer risk factors, most of them had poor awareness (76.64%), while the minority had good level of awareness (23.36%). Finally, regarding students' smoking status, most students did not currently smoke (304, 86.6%), while 47 (13.4%) did smoke (Table 1 & Figure 1).

**Table 1 Demographic data**

Variable	Category	Frequency (%)
Age ( <i>mean [SD]</i> )	(22.2 ± 1.33)	
Age	18	1 (0.3%)
	19	8 (2.3%)
	20	26 (7.4%)
	21	56 (16.0%)
	22	94 (26.8%)
	23	104 (29.6%)
	24	55 (15.7%)
	25	6 (1.7%)
	27	1 (0.3)
Gender	Male	237 (67.5%)
	Female	114 (32.5%)
College	Medicine	268 (76.4%)
	Dentistry	9 (2.6%)
	Applied medical sciences	35 (10.0%)
	Pharmacy	23 (6.6%)
	Nurse	6 (1.7%)
	Public Health	10 (2.8%)
Academic year	2nd year	33 (9.4%)
	3rd year	31 (8.8%)
	4th year	95 (27.1%)
	5th year	107 (30.5%)
	6th year	72 (20.5%)
	Intern	13 (3.7%)
Heard about lung cancer	Yes	351 (95.12%)
	No	18 (4.88%)
Smoker	Yes	47 (13.4%)

	No	304 (86.6%)
Knowledge of Lung cancer	Good Knowledge	82 (23.36%)
	Poor Knowledge	269 (76.64%)



**Figure 1** pie chart for students' level of knowledge

The awareness scores were obtained from 11 questions concerning lung cancer. The awareness level of each question is given in (Table 2). The level of awareness about Lung cancer based on the questions: Most of the students' answers to the questions about lung cancer risk factors appear to suggest that the majority of the students had poor awareness.

Table 2 Knowledge about Lung Cancer risk factors.			
Question	Yes	No	I don't know
Do you think smoking cigarette (tobacco smoking) is one of the risk factors for developing lung cancer?	334 (95.2%)	9 (2.6%)	8 (2.3%)
Do you think electronic cigarette smoking is one of the risk factors for developing lung cancer?	280 (79.8%)	24 (6.8%)	47 (13.4%)
Do you think Shisha smoking is one of the risk factors for developing lung cancer?	325 (92.6%)	9 (2.6%)	17 (4.8%)
Do you think chili and deep-fried food are linked to lung cancer?	41 (11.7%)	220 (62.7%)	90 (25.6%)
Do you think alcohol is a risk factor of lung cancer	125 (35.6%)	126 (35.9%)	100 (28.5%)
Do you think air pollution is a risk factor for lung cancer?	275 (78.3%)	29 (8.3%)	47 (13.4%)
Do you think Asbestos is a risk factor for lung cancer?	179 (51.0%)	27 (7.7%)	145 (41.3%)
Do you think passive smoking is a risk factor for	283 (80.6%)	27 (7.7%)	41 (11.7%)

lung cancer?			
Do you think genetic suitability is a risk factor for lung cancer?	283 (80.6%)	27 (7.7%)	41 (11.7%)
Do you think exercise reduce lung cancer?	174 (49.6%)	76 (21.7%)	101 (28.8%)
Do you think lung cancer is inherited disease?	137 (39.0%)	126 (35.9%)	88 (25.1%)
Do you think comorbid diseases such as Chronic obstructive pulmonary disease (COPD), diabetes mellitus and dyslipidaemia are related to lung cancer?	177 (50.4%)	83 (23.6%)	91 (25.9%)

The awareness of lung cancer level varied among the different questions associated with the demographical data, as described in (Table 3). There are significant differences among gender and academic year (p-value, 0.007, 0.005, respectively), while no significant differences among students' collages (p-value, 0.835). Furthermore, female students represent a better level of knowledge. Moreover, medical students have had the highest level of awareness. On the other hand, nursing students have had the lowest level of awareness. Additionally, students at higher academic years have shown a much better awareness than junior students (Table 3).

Table 3 Association between level of awareness and Demographic data			
Variable	Level of knowledge		P VALUE
	Poor n (%)	Good n (%)	
Gender			
Male	192 (81.0%)	45 (19.0%)	0.007*
Female	77 (67.5%)	37 (32.5%)	
College			
Medicine	208 (77.6%)	60 (22.4%)	0.835
Dentistry	8 (88.9%)	1 (11.1%)	
Applied medical sciences	25 (71.4%)	10 (28.6%)	
Pharmacy	17 (73.9%)	6 (26.1%)	
Nurse	4 (66.7%)	2 (33.3%)	
Public Health	7 (70.0%)	3 (30.0%)	
Academic year			
2nd year	23 (69.7%)	10 (30.3%)	0.005*
3rd year	24 (77.4%)	7 (22.6%)	
4th year	85 (89.5%)	10 (10.5%)	
5th year	77 (72.0%)	30 (28.0%)	

6th year	48 (66.7%)	24 (33.3%)	
Intern	12 (92.3%)	1 (7.7%)	

#### 4. DISCUSSION

This study of health-related specialties students in Makkah, Saudi Arabia, showed that about two-thirds of the participants have a poor level of awareness (76.6%). This result is different from the Malaysian study in which (93%) of participants have good awareness levels (Al-Naggar, 2012). In this study, the most of the students were men (67.5%). This is different from another study that was conducted in Nepal, in which male participants accounted for (50.7%) (Ashok, 2019), and studies that were conducted in Indonesian, Malaysian, Australian, and the US in which female participants were predominate (Sholih et al., 2019; Crane et al., 2016; Chalian et al., 2018; Al-Naggar, 2012; Zainuddin and Thabit, 2018). Smoking is a well-known lung cancer risk factor in both genders (Koo et al., 1985). In this study, most of the participants (95.2%) understood that smoking cigarettes is a risk factor, and this is near similar to a Malaysian study in which (100%) of participants believed that smoking is a risk factor to develop lung cancer (Al-Naggar, 2012).

The fundamental association established between passive smoking and lung cancer can illustrate 1.6% of lung cancers (Boffetta, 2006). A meta-analysis (Hackshaw et al., 1997) and a comprehensive review (Whytrow et al., 2003) revealed a (1.14–5.20) relative risk of lung cancer in people who are passively exposed to cigarette smoking. In our study, we found that (80.6%) of participants recognized that passive smoking represents a significant risk factor of lung cancer. Moreover, many other studies have suggested that smoking and second-hand tobacco use also have a significant risk of developing lung cancer (Siahpush et al., 2006; Boffetta, 2006). Most participants of this study did not smoke (86.6%), concurring with a Nepalese study (82.6%) (Ashok, 2019). However, this is quite different from other international studies in which smoker participants were predominant (Crane et al., 2016; Chalian et al., 2018).

In this study, the most of the participants (79.8%) think that Electronic Cigarettes are a risk factor for lung cancer; in contrast, only (13%) believed that Shisha smoking is a risk factor. Additionally, most of the participants believed that Air pollution is a risk factor (78.3%), and that was similar to the Malaysian study (89.2%), (Al-Naggar, 2012) as the majority believed that it is a risk factor to develop lung cancer. The current study found that only (35.6%) of the participants believed that alcohol is a risk factor to develop lung cancer, and (49.6%) stated that exercise prevents lung cancer, in contrast to what participants believed in a Malaysian study (75.6%) and (83.1%) respectively (Al-Naggar, 2012). Many workplaces could expose their employees to different kinds of carcinogens such as chrysotile asbestos and crystalline silica (Boffetta, 2004). Moreover, these kinds of carcinogens show a significant risk for lung cancer (Boffetta, 2004).

In the present study, (51.0%) of participants mentioned that occupational asbestos exposure is a risk factor for lung cancer. This differs from the Malaysian study in which approximately three-quarters of participants (75.6%) stated that occupational exposure to asbestos is a risk factor (Al-Naggar, 2012). Family history is a significant factor for developing lung cancer in both genders, as most of the studies have revealed a smoking-adjusted raise the risk by approximately (2–4 folds) when linked to a positive family history of lung cancer (Wu et al., 1996; Browns et al., 1997; Liu et al., 1991). Furthermore, there are several investigations concerning the genetic tendency of lung cancer (Bartsch et al., 2000; Lan et al., 2000; Bouchard et al., 2001). In this study, (80.6%) of participants believed that genetic susceptibility plays a vital role in inducing lung cancer; however, (39.0%) stated that hereditary inheritance is a significant risk factor for developing lung cancer. This is similar to the previous Malaysian study in which (48.4%) of participants stated that lung cancer inheritance is essential and linked to lung cancer (Al-Naggar, 2012).

Recent studies have suggested that comorbid diseases such as chronic obstructive pulmonary disease, diabetes mellitus, and dyslipidemia are linked to lung cancer (Durham and Adcock, 2015; Sekine et al., 2012; Hao et al., 2018; Lee et al., 2013). In the current study, (50.4%) of participants stated that comorbid diseases are related to lung cancer. Our study has some limitations that it is not generalizable because it has been conducted only in one university in Saudi Arabia. Most of the participants were from the College of Medicine. Therefore, additional researches should be done in other colleges and universities.

#### 5. CONCLUSION

The study has shown that the awareness level of lung cancer among students was affected by different factors. These factors include gender, academic year, and specialties of the students. Female students have significantly shown a better level of awareness than male students. Furthermore, medical students have had the highest level of awareness; on the other hand, nursing students have had the lowest. Moreover, students in higher academic years have shown a much better awareness than junior students.



### Acknowledgement

We thank the participants who were all contributed samples to the study.

### Ethical approval

The study was approved by the Medical Ethics Committee of Umm Al-Qura University (ethical approval code: HAPO-02-K-012-2021-03-626).

### Funding

This study has not received any external funding.

### Conflict of Interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are presented in the paper.

## REFERENCES AND NOTES

- Al-Naggar RA. Knowledge and practice towards lung cancer among university students. *J Community Med Health Edu* 2012; 2(134):2.
- Althubiti MA, Eldein MMN. Trends in the incidence and mortality of cancer in Saudi Arabia. *Saudi med j* 2018; 39(12):1259-62.
- Anand P, Kunnumakara AB, Sundaram C, Harikumar KB, Tharakan ST, Lai OS, Sung B, Aggarwal BB. Cancer is a preventable disease that requires major lifestyle changes. *Pharma res* 2008; 25(9):2097-116.
- Bartsch H, Nair U, Risch A, Rojas M, Wikman H, Alexandrov K. Genetic polymorphism of CYP genes, alone or in combination, as a risk modifier of tobacco-related cancers. *Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*. 2000; 9(1):3-28.
- Boffetta P. Epidemiology of environmental and occupational cancer. *Oncogene* 2004; 23(38):6392-403.
- Boffetta P. Human cancer from environmental pollutants: the epidemiological evidence. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis*. 2006; 608(2):157-62.
- Bouchardy C, Benhamou S, Jourenkova N, Dayer P, Hirvonen A. Metabolic genetic polymorphisms and susceptibility to lung cancer. *Lung cancer (Amsterdam, Netherlands)*. 2001; 32(2):109-12.
- Brownson RC, Alavanja M, Caporaso N, Berger E, Chang JC. Family history of cancer and risk of lung cancer in lifetime non-smokers and long-term ex-smokers. *Int J epidemiol* 1997; 26(2):256-63.
- Chalian H, Khoshpouri P, Assari S. Demographic, Social, and Behavioral Determinants of Lung Cancer Perceived Risk and Worries in a National Sample of American Adults; Does Lung Cancer Risk Matter? *Medicina (Kaunas, Lithuania)* 2018; 54(6):97.
- Crane M, Scott N, O'Hara BJ, Aranda S, Lafontaine M, Stacey I, Varlow M, Currow D. Knowledge of the signs and symptoms and risk factors of lung cancer in Australia: mixed methods study. *BMC Public Health* 2016; 16(1):508.
- Cruz CSD, Tanoue LT, Matthay RA. Lung cancer: epidemiology, etiology, and prevention. *Clin Chest Med* 2011; 32(4):605-44.
- de Torres JP, Marín JM, Casanova C, Cote C, Carrizo S, Cordoba-Lanus E, Baz-Dávila R, Zulueta JJ, Aguirre-Jaime A, Saetta M. Lung cancer in patients with chronic obstructive pulmonary disease: incidence and predicting factors. *Am J Respir Crit Care Med* 2011; 184(8):913-9.
- Durham A, Adcock I. The relationship between COPD and lung cancer. *Lung Cancer (Amsterdam, Netherlands)* 2015; 90(2):121-7.
- Elasbali AM, Shalabi MG, Mohammed SA, Abbas AM, Alrashid FF, Alharbi SH, Alyahyawi A, Ahmed HG. Prediction of the critical cancers in Northern Saudi Arabia. *Medical Science* 2021;25(109):595-601
- Food Consumption: Food and Agriculture Organization of United Nation. 2011. [[cited 2018 Feb 06]]. Available from: [http://www.fao.org/fileadmin/.../jFoodConsumptionNutrients\\_en.xls](http://www.fao.org/fileadmin/.../jFoodConsumptionNutrients_en.xls).
- Gangane N, Ng N, Sebastian MS. Women's Knowledge, Attitudes, and Practices about Breast Cancer in a Rural District of Central India. *Asian Pac J Cancer Prev* 2015; 16(16):6863-70.

17. Gk T, Am L. Familial aggregation of lung cancer in humans. *J the National Cancer Institute* 1963; 30:289-312.
18. Globocan. Cancer today, Available from: [http://globocan.iarc.fr/Pages/fact\\_sheets\\_population.aspx](http://globocan.iarc.fr/Pages/fact_sheets_population.aspx) . [Last accessed on 2017 May 13]
19. Goodarzi E, Momenabadi V, Seraji M, Naemi H, Khazaei Z. Incidence and mortality of breast cancer and Human development Index: An updated study on the Asian population in 2018. *Medical Science* 2020;24(102):623-631
20. Hackshaw AK, Law MR, Wald NJ. The accumulated evidence on lung cancer and environmental tobacco smoke. *Bmj*. 1997; 315(7114):980-8.
21. Hao B, Yu M, Sang C, Bi B, Chen J. Dyslipidemia and non-small cell lung cancer risk in Chinese population: a case-control study. *Lipids Health Dis* 2018; 17(1):278-.
22. Ibrahim E, Sadiq BMB, Banjar L, Awadalla S, Abomelha MS. Current and future cancer burden in Saudi Arabia: meeting the challenge. *Hematol/oncol stem cell therap* 2008;1(4):210-5.
23. Indonesian Health Ministry. Information data centre stop kanker. Jakarta, Indonesia: Indonesian Health Ministry Press; 2013.
24. Jeppu AK, Jailani NABM, Kumar KA. Knowledge about Lung Cancer and Awareness of its Risk Factors among the University Students. *Indian J Public Health Res Develop* 2019; 10(1):633-7.
25. Koo L, Ho JHC, Lee N. An analysis of some risk factors for lung cancer in Hong Kong. *Int J Cancer* 1985; 35(2):149-55.
26. Krinsky NI, Johnson EJ. Carotenoid actions and their relation to health and disease. *Molecular aspects of medicine*. 2005; 26(6):459-516.
27. Lam WK. Lung cancer in Asian women-the environment and genes. *Respirology (Carlton, Vic)*. 2005; 10(4):408-17.
28. Lan Q, He X, Costa DJ, Tian L, Rothman N, Hu G, Mumford JL. Indoor coal combustion emissions, GSTM1 and GSTT1 genotypes, and lung cancer risk: a case-control study in Xuan Wei, China. *Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*. 2000; 9(6):605-8.
29. Lee J-Y, Jeon I, Lee JM, Yoon J-M, Park SM. Diabetes mellitus as an independent risk factor for lung cancer: a meta-analysis of observational studies. *European J cancer (Oxford, England: 1990)*. 2013; 49(10):2411-23.
30. Liu Z, He X, Chapman RS. Smoking and other risk factors for lung cancer in Xuanwei, China. *Int J epidemiol* 1991; 20(1):26-31.
31. Lowenstein LM, Richards VF, Leal VB, Housten AJ, Bevers TB, Cantor SB, Cinciripini PM, Cofta-Woerpel LM, Escoto KH, Godoy MCB, Linder SK, Munden RF, Volk RJ. A brief measure of Smokers' knowledge of lung cancer screening with low-dose computed tomography. *Preventive Medicine Reports* 2016; 4(2211-3355):351-356.
32. Mahfouz MEM, Alharthi QM, Althobaiti MS, Alfaqeeh AS, Alosimi NK, Alshehri WA, Alsufyani AH. Prevalence of lungs cancer risk factors among the Saudi population. 2020.
33. Mazières J, Pujol J-L, Kalampalikis N, Bouvry D, Quoix E, Filleron T, Targowla N, Jodelet D, Milia J, Milleron B. Perception of lung cancer among the general population and comparison with other cancers. *J thoracic oncology: official publication of the International Association for the Study of Lung Cancer*. 2015; 10(3):420-5.
34. Ruano-Ravina A, Figueiras A, Freire-Garabal M, Barros-Dios J. Antioxidant vitamins and risk of lung cancer. *Current pharmaceutical design*. 2006; 12(5):599-613.
35. Sekine Y, Katsura H, Koh E, Hiroshima K, Fujisawa T. Early detection of COPD is important for lung cancer surveillance. *Eur Resp J* 2012; 39(5):1230-40.
36. Shankar A, Roy S, Rath G. P3.06-007 Level of Awareness of Various Aspects of Lung Cancer among College Students in India: Impact of Cancer Awareness Programs. *J Thoracic Oncol* 2017; 12(11):S2296-S7.
37. Sholih MG, Perwitasari DA, Hendriani R, Sukandar H, Barliana MI, Suwantika AA, Abdulah R, Febriyanti M, Septian E, Diantini A. Knowledge, Attitudes, and Practices of Lung Cancer Risk Factors in West Bandung Society. *J Pharm Bioallied Sci* 2019; 11(Suppl 4):S574-S9.
38. Sholih MG, Perwitasari DA, Hendriani R, Sukandar H, Barliana MI, Suwantika A, Nurmantya I, Diantini A. Risk factors of lung cancer in Indonesia: A qualitative study. *J Adv Pharm Educ Res* 2019; 9(2):41-5.
39. Siahpush M, McNeill A, Hammond D, Fong GT. Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: results from the 2002 International Tobacco Control (ITC) Four Country Survey. *Tobacco control* 2006; 15(Suppl 3):iii65-70.
40. Siems W, Wiswedel I, Salerno C, Crifò C, Augustin W, Schild L, Langhans C-D, Sommerburg O.  $\beta$ -Carotene breakdown products may impair mitochondrial functions--potential side effects of high-dose  $\beta$ -carotene supplementation. *The J nutritional biochemistry* 2005; 16(7):385-97.
41. Sullivan KM, Dean A, Soe MM. On academics: OpenEpi: a web-based epidemiologic and statistical calculator for public health. *Public Health Rep* 2009; 124(3):471-4.
42. Tammemägi MC, Katki HA, Hocking WG, Church TR, Caporaso N, Kvale PA, Chaturvedi AK, Silvestri GA, Riley TL, Commins J, Berg CD. Selection criteria for lungcancer screening. *N Engl J Med* 2013; 368(8):728-36.
43. Whitrow MJ, Smith BJ, Pilotto LS, Pisaniello D, Nitschke M. Environmental exposure to carcinogens causing lung cancer:



- epidemiological evidence from the medical literature. *Respirology* (Carlton, Vic) 2003; 8(4):513-21.
44. Wu AH, Fontham ET, Reynolds P, Greenberg RS, Buffler P, Liff J, Boyd P, Correa P. Family history of cancer and risk of lung cancer among lifetime nonsmoking women in the United States. *Am J epidemiol* 1996; 143(6):535-42.
  45. Zainuddin N, Thabit H. Knowledge and Perception on Lung Cancer and Its Screening: A Study among Undergraduate Students of the International Islamic University Malaysia, Kuantan Campus. *J Biomed Clin Sci (JBCS)* 2018; 2(2):61-6.
  46. Zhang Y, Tao S, Shen H, Ma J. Inhalation exposure to ambient polycyclic aromatic hydrocarbons and lung cancer risk of Chinese population. *Proc Natl Acad Sci* 2009; 106(50):21063-7.